

REMARKS

This is in full and timely response to the Office Action mailed April 2, 2003. Reexamination and reconsideration in light of the above amendments and the following remarks is respectfully requested.

By the foregoing amendment, claims 1, 3-10, 12-18 and 20 were amended. Claim 1 was amended to include the elements of claim 2, and claim 2 was cancelled without prejudice or disclaimer to its underlying subject matter. Claim 1 was further amended to change the term "unit" to "moiety." Claims 1, 2-10, 12-18 and 20 were amended to change the term "prepuff" to "pre-expanded foam particles." The specification was also amended to recite that "pre-expanded foam particles" and "prepuff" are interchangeable. Claims 6 and 16 were amended to recite that the melt tension is measured at 270°C. The specification was also amended to add the melt tension measurement conditions, that is, that the melt tension is measured at 270°C, using an extrusion rate of 30 mm/min (shear rate: 364.8 sec⁻¹) and a haul off rate of 100 mm/min. No prohibited new matter was added. Claims 1 and 3-20 are currently pending for the Examiner's reconsideration, with claim 1 being independent.

Applicants' Representative thanks the Examiners Chang and Zirker for the courtesies extended during the June 17, 2003 personal interview.

Personal Interview Summary

As required under MPEP 713.04, the following is Applicants' Interview Summary:

Discussing the §112 rejection, the examiners were shown US Patent 6,451,917 detailing the term melt tension and melt index. US Patent 6,451,917, col. 3, lines 8-16. The examiner agreed that the claim term melt tension was acceptable. The examiner asked that a temperature limitation be added to the claim and the specification, as melt tension is generally associated with the test temperature. Additionally, the examiners asked that the claim term "prepuff" be changed to "pre-expanded foam particles" or something similar in both the claims and the specification. This is consistent with the title of the specification as changed by WIPO. With respect to claim 1, the examiners asked if "unit" can be changed to "monomer" or to "moiety."

Discussion of the applied references covered bulk density ranges, crystallization peak temperature ranges, and the percentage amount of isophthalic acid or 1,4 cyclohexanedimethanol. Regarding the applied references, The examiner clearly understood that there were no apparent

overlapping ranges, and that the present specification clearly discussed the criticality of the claimed range of isophthalic acid or 1,4 cyclohexanedimethanol between 0.5 and 10%.

Accordingly, Applicants' affirm the substance of the June 17, 2003 Interview Summary (Paper No. 10).

Rejections under 35 U.S.C. §112

Claims 6, 7, 12-14 and 16-19 are rejected under 35 U.S.C. §112, second paragraph.

As agreed during the personal interview, the term "melt tension" has a distinct meaning, namely, the tension force the recited resin reaches when stretched at ambient temperature unless a different temperature is indicated. A search on the U.S. Patent Office database using the term "melt tension" in the claims revealed more than 50 patents. Consequently, the term is generally understood by those skilled in the art. Regarding claims 6 and 16, as discussed and agreed during the personal interview, the term "melt tension" is acceptable, and the claims were amended to include the temperature at which the measurements is taken. The specification was similarly amended. Accordingly, withdrawal of this rejection is requested.

Regarding claims 12, this claim was amended to more clearly recite the structural position of the film or sheet, that is, the molded foam article of claim 10 is laminated with a film or sheet of an aromatic polyester resin. Claim 14 was similarly amended. Accordingly, withdrawal of this rejection is requested.

Rejections under 35 U.S.C. §103

Claims 1 to 20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over JP 08-174590 ("JP '590") alone, or in view of U.S. Patent No. 5,475,037 to Park et al. ("Park et al. '037"). These rejections are respectfully traversed.

Claim 1 recites a moldable crystalline aromatic polyester resin pre-expanded foam particles, having a bulk density in the range of from 0.01 to 1.0 g/cm³ and a crystallization peak temperature in the range of from 130 to 180°C, wherein the resin contains at least one moiety of a moiety derived from isophthalic acid or a moiety derived from 1,4-cyclohexanedimethanol in a total amount ranging from 0.5 to 10% by weight of the crystalline aromatic polyester resin.

As conceded by the Examiner, JP '590 teaches an expanded material which has a bulk density of 0.02 to 0.7 g/cm³, but makes no mention of the bulk density of the pre-expanded particles which, prior to being expanded, form the expanded material. There is no reason that a person of ordinary skill in the art would determine that a pre-expanded foam particles should have the presently claimed bulk density based on JP '590, when JP '590 explicitly teaches that the only material that has a bulk density which reads on that of the present claims is already in an expanded state.

Further, claim 1 teaches that the pre-expanded foam particles have "a crystallization peak temperature in the range of from 130 to 180°C." Even in the event that a person of skill in the art would happen to form a pre-expanded foam particles of the claimed bulk density discussed above from application of the teachings of JP '590, it would not naturally follow that the pre-expanded foam particles obtained thereby would have the claimed crystallization peak temperature. The crystallization peak temperature is the temperature at which a maximum crystallization speed is reached during a heating process. The crystallization peak temperature is a function of the materials used to form the pre-expanded foam particles. For example, the present specification (page 9, lines 20 to 24) teaches that PET has a crystallization peak temperature that does not reach 130 °C. Compare this with JP '590, which teaches that PET is the most preferred resin used to form an expanded material (paragraph 0015). As claim 1 recites, where the resin pre-expanded foam particle contains at least one moiety of a moiety derived from isophthalic acid or a moiety derived from 1,4-cyclohexanedimethanol in a total amount ranging from 0.5 to 10% by weight of the crystalline aromatic polyester resin, the crystallization peak temperature is within the range set forth in this claim. Applicants note that JP '590 (paragraph 0015) teaches that compounds such as isophthalic acid and cyclohexane dimethanol can be included to obtain the resin that forms the expanded material. However, JP '590 fails to teach that these compounds merely form a minor part of the resin, but instead teaches that these compounds are used as monomer units that make up a totality of a polymer. A person of ordinary skill in the art would, at best, be motivated to form a resin having a much higher concentration than 0.5 to 10% of the isophthalic acid or 1,4-cyclohexanedimethanol from reviewing JP '590, and would therefore not reach the features of claim 1. More fundamentally, the person of ordinary skill in the art would not be motivated to form a resin material having the crystallization peak temperature in light of the deficient teachings of JP '590 in this respect.

The Office Action makes the sweeping assertion that "it is well known that the crystallinity of PET can be modified by copolymerizing terephthalic acid with cyclohexanedimethanol and/or isophthalic acid." Even if this is taken to be true, it is clear that there are many reasons for modifying the crystal structure of a resin material, and obtaining a resin having an ideal crystallization peak temperature is only one such reason. Because JP '590 is completely devoid of teachings regarding any crystallization peak temperature for a resin, it is respectfully submitted that a person of ordinary skill in the art would not be motivated to reach the claimed subject matter of claim 1 from reading JP '590.

As an alternative rejection of claim 1, the Office Action combined Park et al. '037 with JP '590. The Office Action asserts that Park et al. '037 teaches a low density foam formed from an amorphous polyethylene terephthalate copolymer via molding of expanded foam particles, and that the copolymer resin can be obtained by copolymerizing isophthalic acid and cyclohexanedimethanol, or mixtures thereof, in an amount of from about 15% to about 50% of the total copolymer formed thereby. Although these percentages (presumed to be measured by weight) are higher than the claimed concentrations in former claim 2, the Office Action asserts that *in the absence of unexpected results* obtained through the claimed concentrations, it would have been obvious to one skilled in the art to modify Park et al. '037 as combined with JP '590 to reach the presently claimed invention.

Applicants respectfully traverse the rejection in light of the appropriate rule of law concerning optimization of ranges and differences in chemical structures, and the evidence presented in the present specification of the criticality of the claimed concentration (0.5 to 10%) of either 1,4-cyclohexanedimethanol or isophthalic acid and the superior results obtained from such a concentration. M.P.E.P. § 2144.05 instructs that an invention is not obvious over prior art that discloses differences in concentrations between chemicals in the prior art and in a claimed invention, where there is evidence on record establishing the criticality of the claimed concentration. The present specification clearly establishes evidence showing the criticality of having between 0.5 and 10% of either 1,4-cyclohexanedimethanol or isophthalic acid in the moldable crystalline aromatic polyester resin pre-expanded foam particles of the invention. The claimed concentration is not one selected merely to avoid the prior art ex post. Rather, the specification and claims as filed repeatedly suggest the criticality of the claimed concentration.

On page 12, lines 8 to 16, the specification teaches:

"When the total content of the IPA unit and/or CHDM unit is smaller than 0.5% by weight, the effect of inhibiting the crystallization is not exerted. On the other hand, when the content of the IPA unit and/or CHDM unit exceeds 10% by weight, the crystallization rate becomes too slow. In either case, a molded foam article or a laminated molded foam article, having a good appearance, strength, and heat-resistance can not be produced....

Clearly then, the present application teaches that the intended product produced by the present invention can not be produced when the ranges of the IPA (isophthalic acid) or the CHDM (1,4-cyclohexanedimethanol) are outside of the claimed range. This statement is, of course, evidence establishing criticality of the claimed range, and is sufficient to satisfy an obviousness rejection. Further, the statements are supported by experimental evidence provided in the present specification. See Tables 5 to 7 (pages 72 to 74), Comparative Example 4, and the supporting text for experimental evidence supporting these statements.

Also, it is respectfully pointed out that the concentrations established in the claims go directly to the chemical structure of the claimed moldable crystalline aromatic polyester resin pre-expanded foam particle. This is in contrast to concentrations of elements in a mixture or solution. M.P.E.P. §2144.09 instructs that an assertion of obviousness based on structural similarity is overcome by proof that the claimed compound provides unexpected results or possesses superior properties. The above discussion clearly explains how the claimed range of isophthalic acid or 1,4-cyclohexanedimethanol provides superior results compared to resins having such monomer components outside of such a range. For at least the above reasons, it is respectfully requested that the rejections of the claims be withdrawn.

Additionally, dependent claims 3-20, being dependent upon allowable claim 1, are also allowable for the reasons above. Moreover, these claims are further distinguished by the additional features recited therein, particularly within the claim combination.

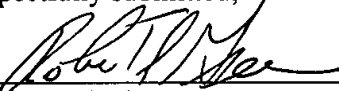
Accordingly, withdrawal of the §103 rejections is respectfully requested.

Conclusion

For the foregoing reasons, claims 1 and 3-20 are in condition for allowance. Accordingly, favorable reexamination and reconsideration of the application in light of these amendments and remarks is courteously solicited. If the examiner has any comments or suggestions that would place this application in even better form, the Examiner is requested to telephone the undersigned attorney at the number below.

Dated: July 2, 2003

Respectfully submitted,

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